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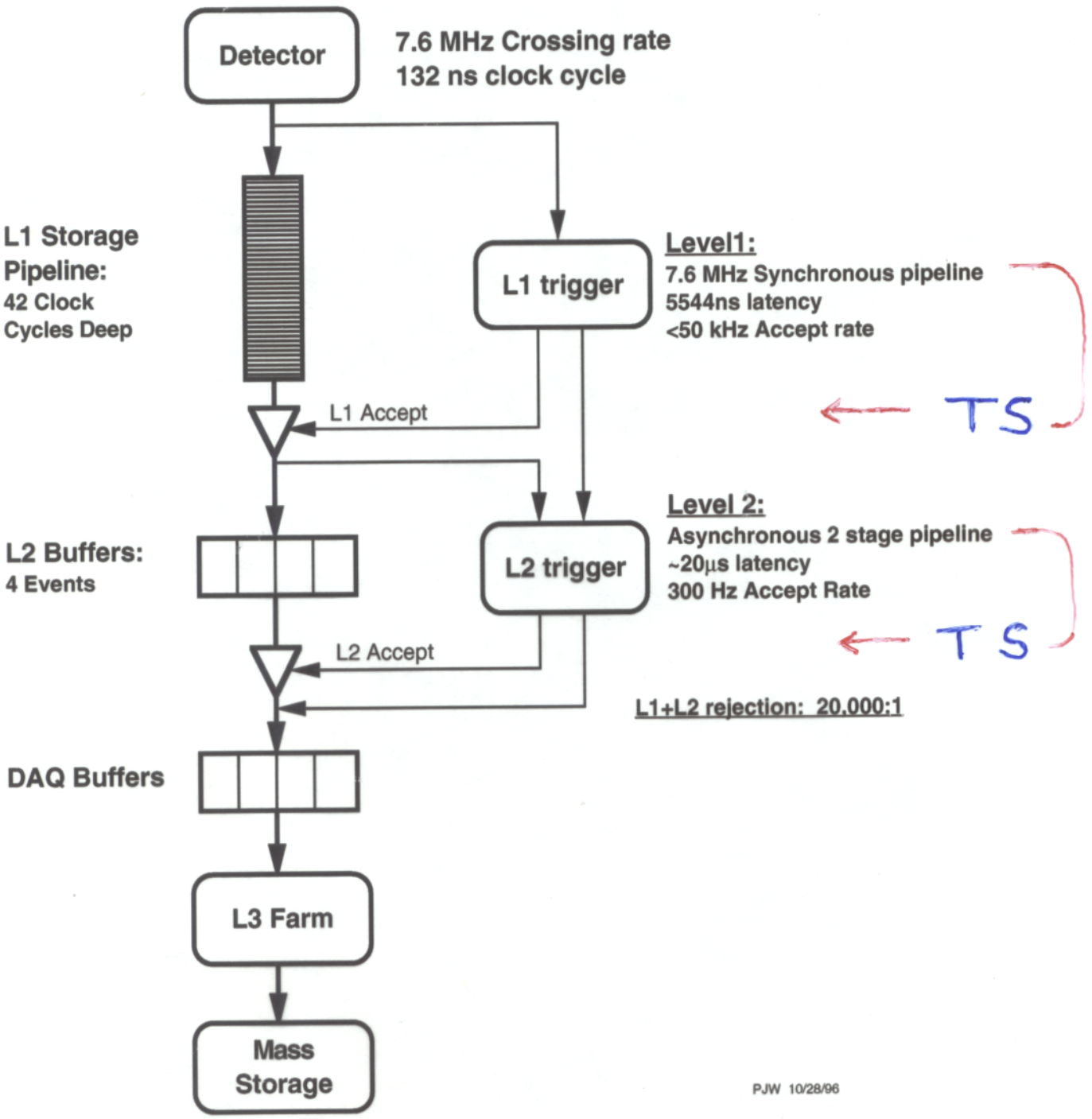
Used for January, 2003 Ace Training

The Trigger System Interface

1 Outline

- The Level 1/Level 2 Trigger
- The Trigger System Interface
  - The Global Level 1 Trigger
  - The Trigger Supervisor
  - The Trigger Crosspoints
  - The Return Crosspoints
  - The Scalers
- The TSI Home Page

Dataflow of CDF "Deadtimeless" Trigger and DAQ



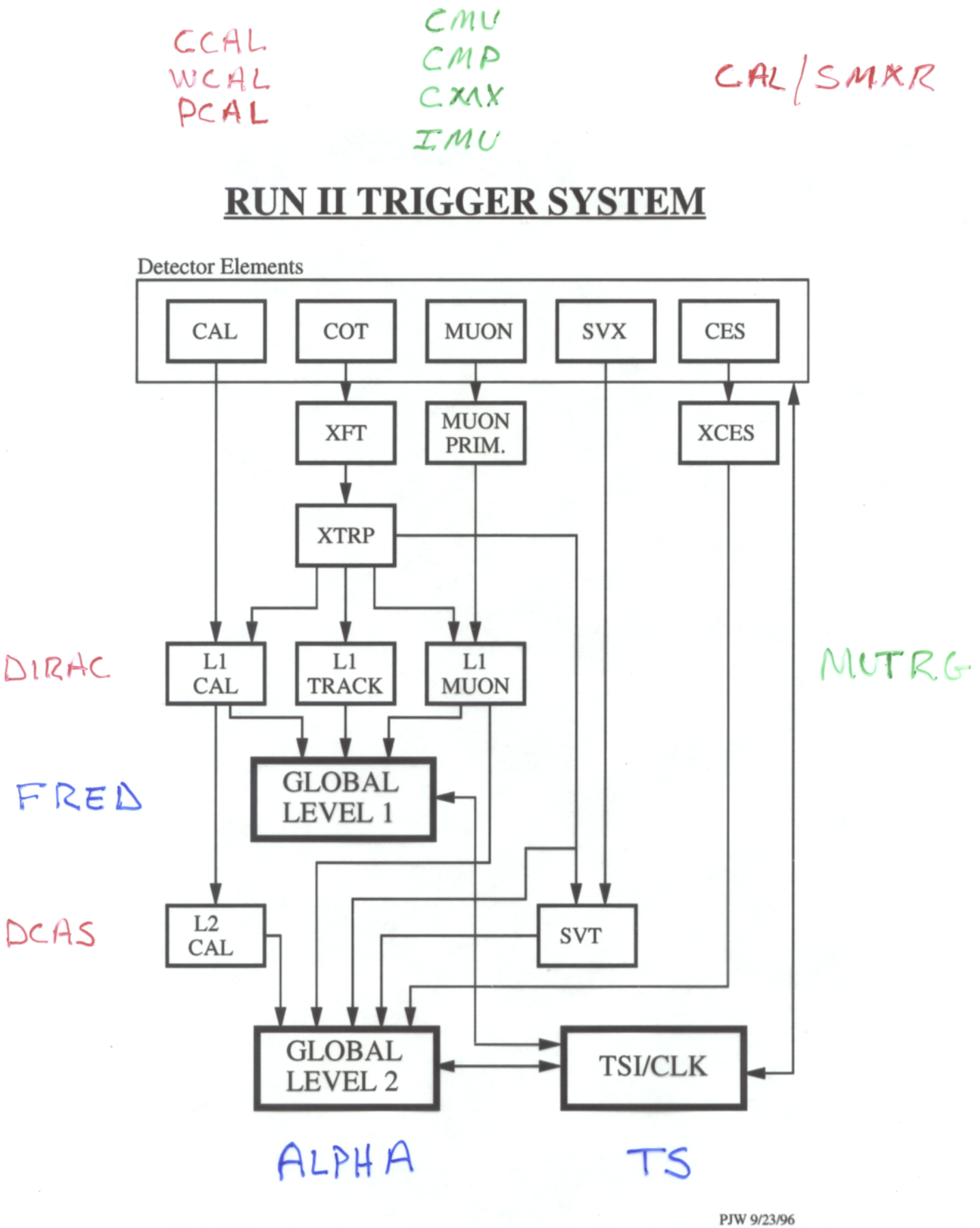
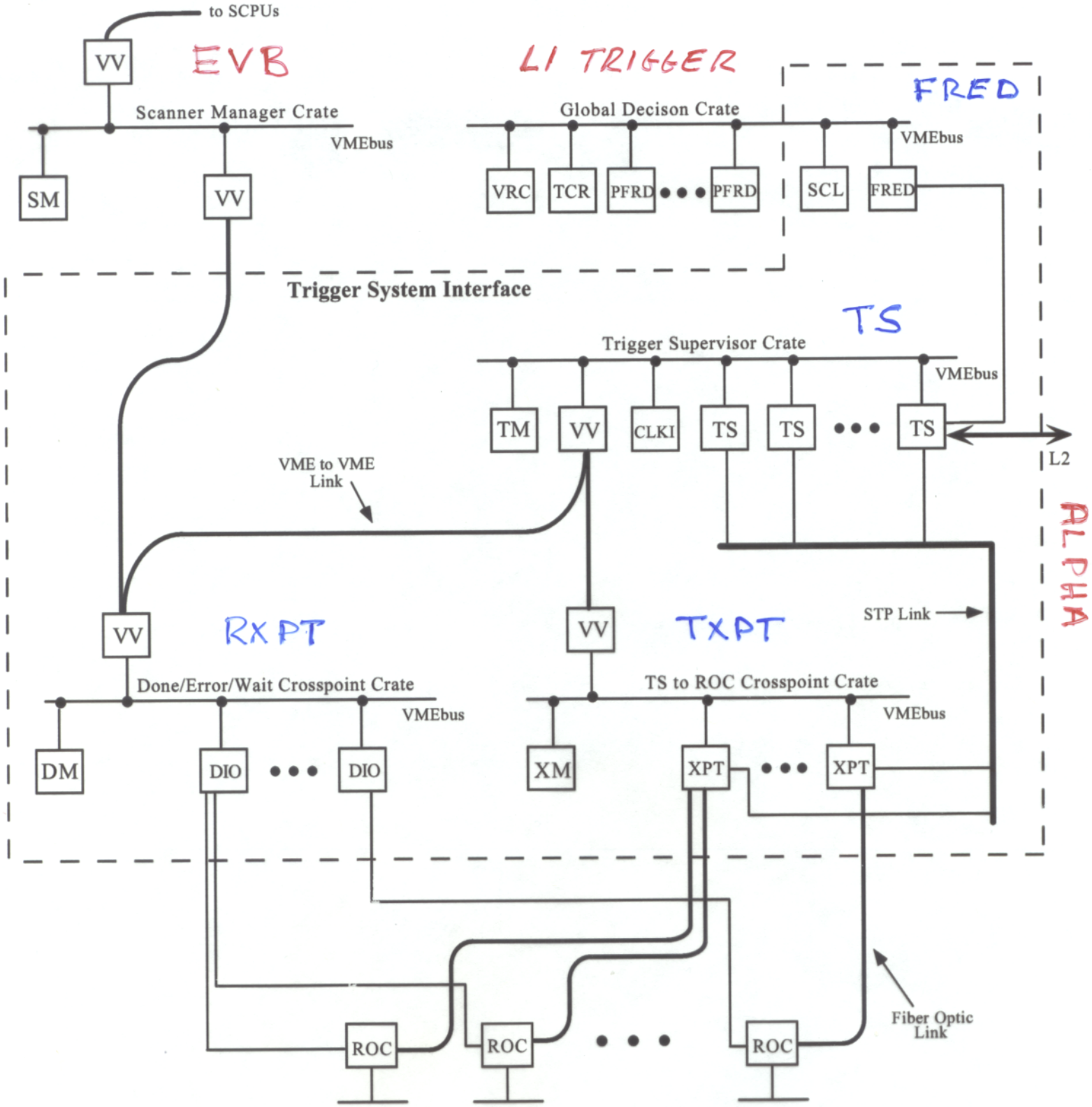


Figure 2: Block diagram of the Run II Trigger System.


to SCPUs
VV
EVB
L1 TRIGGER
FRED
Scanner Manager Crate
VMEbus
Global Decison Crate
VMEbus
SM
VV
VRC
TCR
PFRD
PFRD
SCL
FRED
Trigger System Interface
TS
Trigger Supervisor Crate
VMEbus
TM
VV
CLKI
TS
TS
TS
L2
VME to VME Link
ALPHA
VV
RXPT
VV
TXPT
STP Link
Done/Error/Wait Crosspoint Crate
VMEbus
TS to ROC Crosspoint Crate
VMEbus
DM
DIO
DIO
XM
XPT
XPT
ROC
ROC
ROC
Fiber Optic Link
FRONT-END CRATES
TSI

2 The Global Level 1 Trigger - b0l1gl00

- a.k.a. FRED
- Forms 64 L1 triggers every 132 ns
- Data from calorimeter, muons, tracking, CLC
- Sends preliminary L1 decision to TS
- Sends 64 L1 triggers to Level 2
- Sends trigger data to scalers for rate accounting
- Monitor L1 trigger rates on the DAQMon "Rates and Deadtimes" GUI.
  - Level 1 design rate = 40 kHz
  - Level Bunch Crossing rate = 1.7 MHz
- Check trigger performance with TRIGMON plots; e.g. comparison of Level 1 data in L1 and L2 trigger banks

3 The Trigger Supervisor - b0tsi00

- Controls the synchronous flow of event data from the Front-end crates to the Event Builder
- Manages the filling and readout of the four Level 2 buffers
- Receives L1A/R recommendation from FRED
- Sends out final L1 decision based on L2 buffer availability
- Receives the L2 decision from the L2 (alpha) crate and sends it to the Front-end crates
- Trigger Manager process sends TS event data to Event Builder
- TS sends LIVETIME accounting signals to scaler crate. Check scaler GUI

4 The Trigger Supervisor - cont.

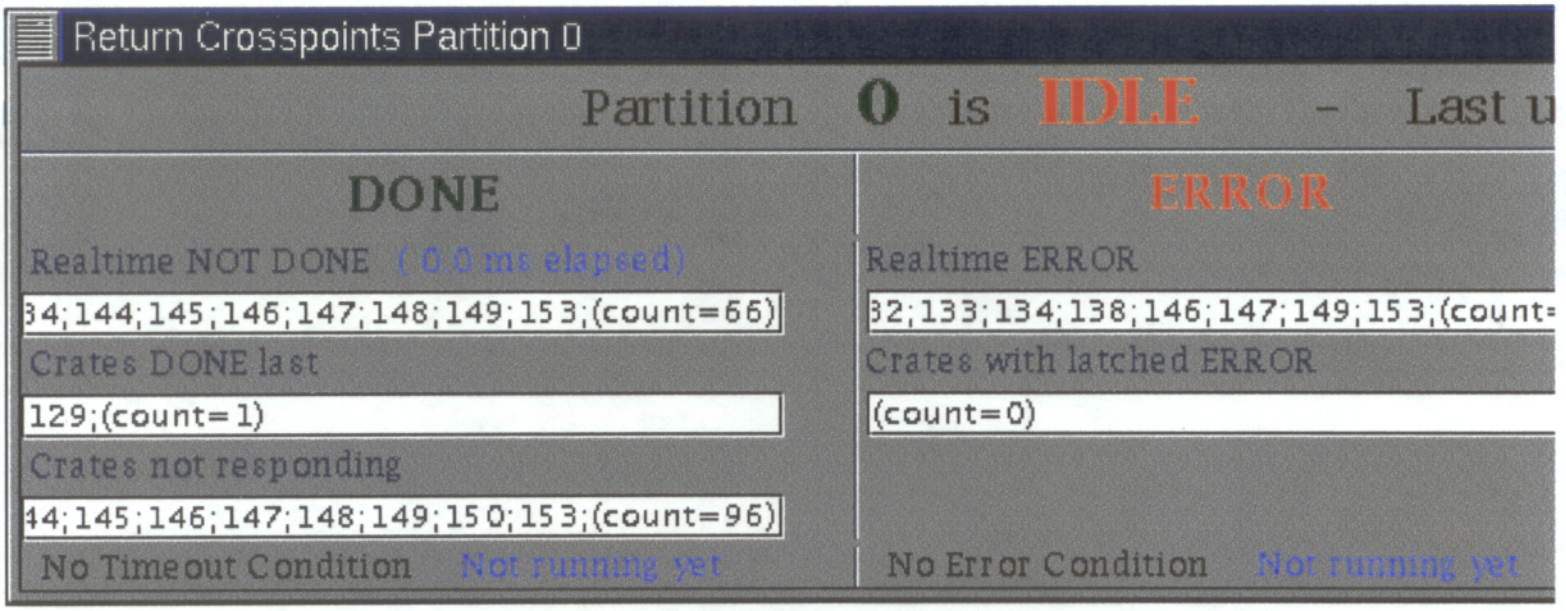
- TS can control Front-end independently of the trigger
  - Auto L1Accept in "calib continous" mode
  - L1Accept based on external calibration signals
  - Auto L2Accept
- There are 8 Trigger Supervisors

5 The Trigger Crosspoints - b0tsi00

- Responsible for partitioning the detector
- Allows subsets of the $\sim$ 120 Front-end crates to be controlled by different Trigger Supervisors
- Routes TS messages (Level 1, Level 2, Calibration) to the TRACERs in the Front-end crates
- There is only one "physics" partition; i.e. the trigger cannot be partitioned
- Note: Each crate is always listening to one partiton

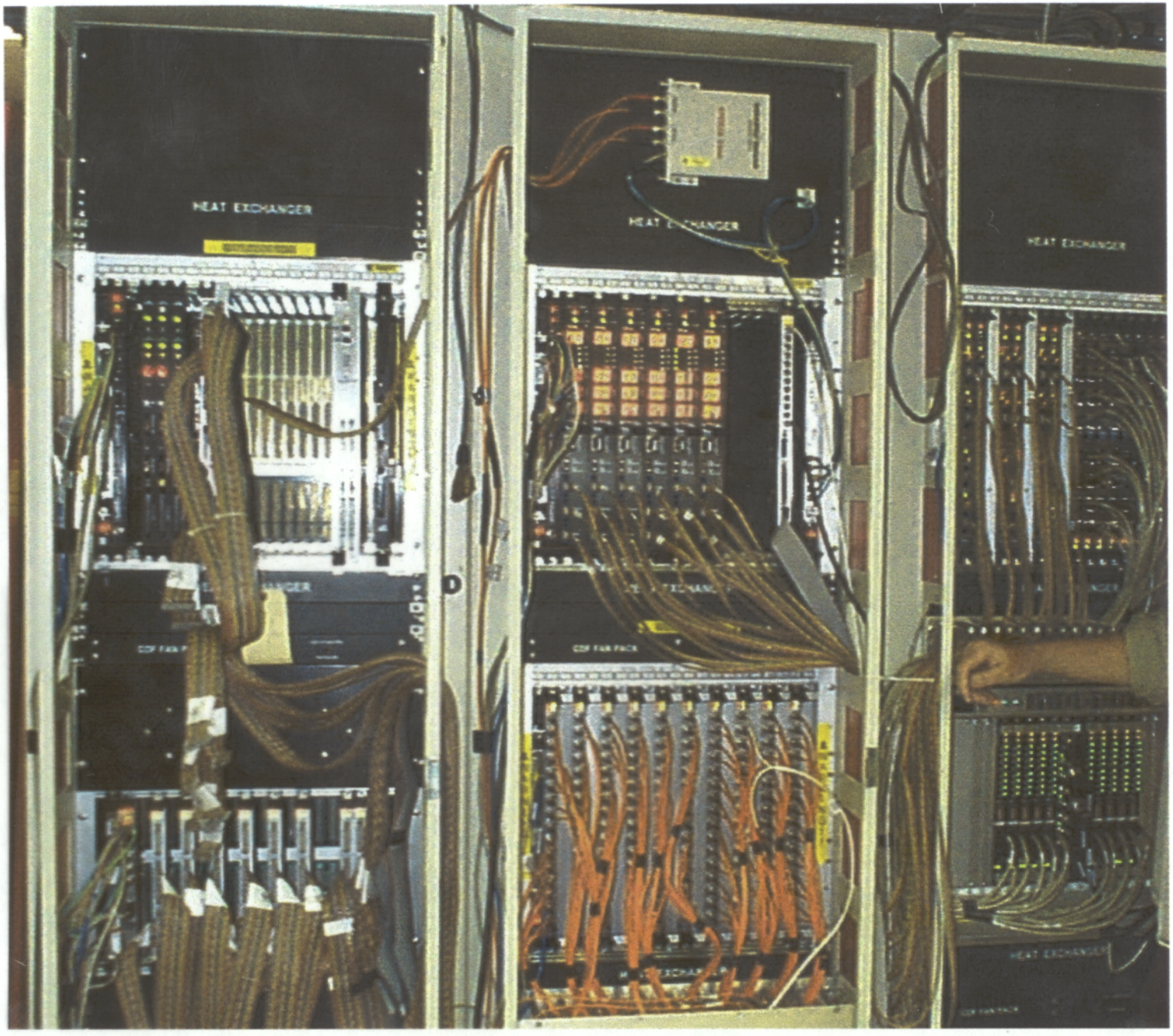
6 The Return Crosspoints - b0tsi02

- Monitors DONE, BUSY and ERROR signals from the TRACERs in the Front-end crates
- DONE de-asserted on receipt of L2 Accept and re-asserted when data readout is complete
- DONE timeout occurs if this takes too long
- BUSY signal sent to RXPT if TRACER/VRB is not ready for another L2A
- BUSY timeout indicates problem at the VRB/EVB interface
- ERROR sent to RXPT from the TRACER if something goes wrong in a Front-end crate
- The ERROR feature is not (yet) widely used
- Monitor Return Crosspoint activity on the DAQ-Mon "RXPT" GUI


Return Crosspoints Partition 0
Partition 0 is IDLE - Last u
DONE
ERROR
Realtime NOT DONE (0.0 ms elapsed)
34;144;145;146;147;148;149;153;(count=66)
Realtime ERROR
32;133;134;138;146;147;149;153;(count=
Crates DONE last
129;(count=1)
Crates with latched ERROR
(count=0)
Crates not responding
44;145;146;147;148;149;150;153;(count=96)
No Timeout Condition
Not running yet
No Error Condition
Not running yet

7 The Scaler Crate - b0tsi03

- Provides L1 trigger rates from FRED data
- Provides global L1 and L2 accpet rates from the TS
- Provides LIVETIME and DEADTIME accounting from the TS
- Information displayed in real time on scaler GUI
- Scaler data also read ut on each L2Accept



SCRAMNet to EVB

RXPT

CLOCK

FRED — SCALERS

TS — TXPT

TSI